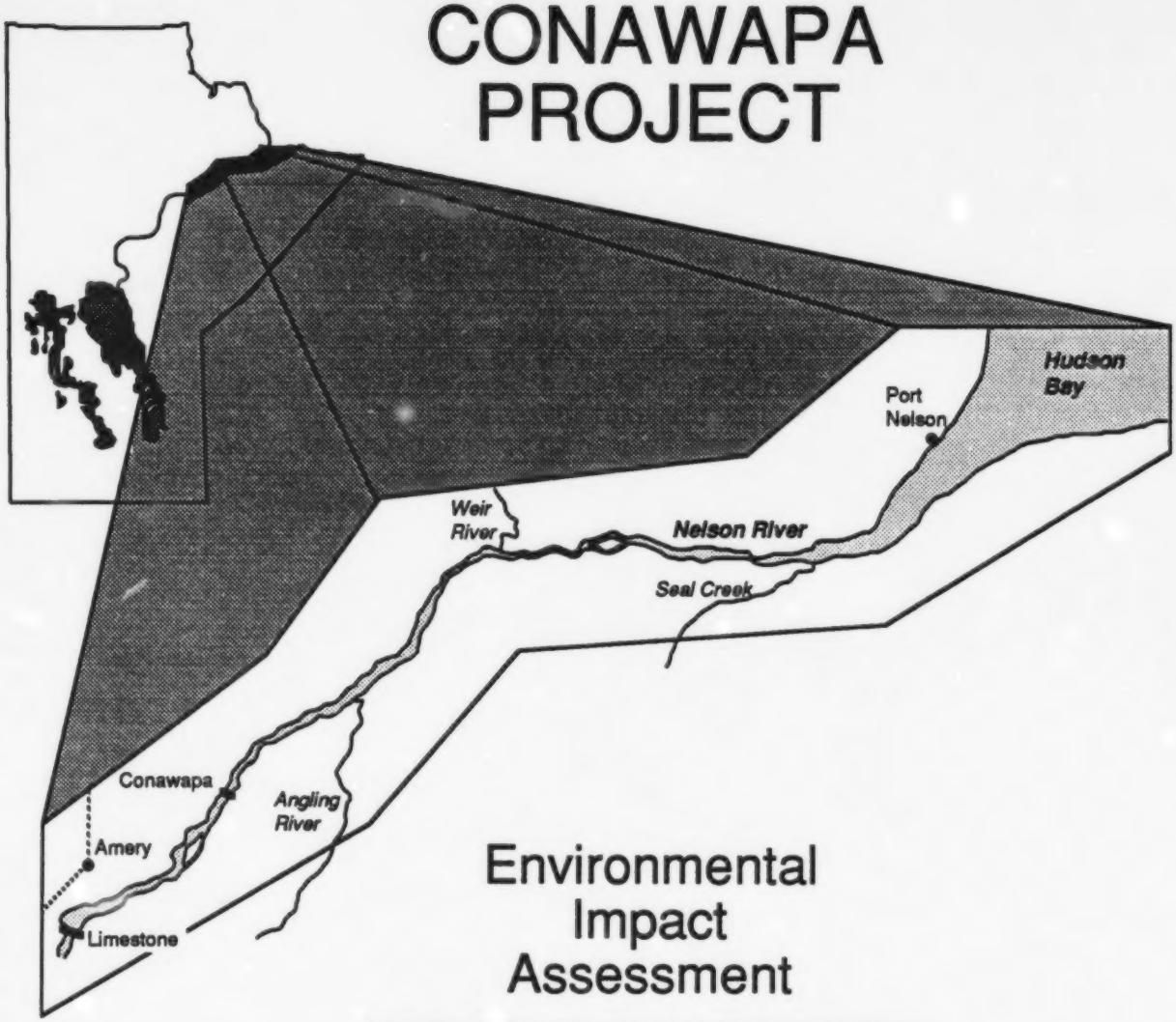
CONAWAPA PROJECT



Environmental Impact Assessment

Preliminary Workplan

July, 1989

manitoba hydro

I.D. Systems Ltd

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CONAWAPA
ENVIRONMENTAL IMPACT ASSESSMENT
WORK PLAN

August, 1989

TABLE OF CONTENTS

		Page No.
1.	INTRODUCTION	1
	1.1 Background	2
	1.2 Objectives	3
	1.3 Scope	4
2.	REGULATORY PROCESSES	6
	2.1 Introduction	6
	2.2 Interdepartmental Planning Board	7
	2.3 Environment Act	8
3.	PROJECT DESCRIPTION	10
	3.1 Introduction	10
	3.2 Schedule	11
	3.3 Project Activities	13
	3.3.1 Exploration Programs	13
	3.3.2 Access Road	15
	3.3.3 Construction Power, Transmission Lines, Collector Transmission Lines	16
	3.3.4 Construction Site Facilities	17
	3.3.5 Personnel and Accommodations	18
	3.3.6 Construction Materials	18
	3.3.7 Materials, Equipment, and Personnel Transport	19
	3.3.8 Station Operation	19
	3.3.9 Environmental Programs	20
4.	WORK PROGRAM	22
	4.1 Environmental Setting	22
	4.2 Purpose	23
	4.3 Work Carried Out	25
	4.3.1 Physical Resources	25
	4.3.2 Terrestrial and Wildlife Resources	26
	4.3.3 Fisheries Resources	26
	4.3.4 Socio-Economic Resources	27
	4.3.5 Heritage Resources	28
	4.4 Work Proposed and Schedule	28
5.	PUBLIC PARTICIPATION AND REGULATORY LIAISON	41
	5.1 Introduction	41
	5.2 Public Participation	41
	5.3 Regulatory Liaison	42

DRAFT
FOR DISCUSSION PURPOSES ONLY

CONAWAPA ENVIRONMENTAL IMPACT ASSESSMENT - WORK PLAN

1. INTRODUCTION

DRAFT
FOR DISCUSSION PURPOSES ONLY

Manitoba Hydro is committed to carrying out environmental impact assessments (EIA) for proposed generating station and transmission projects. Exploration, construction and operational phases of the projects and their ancillary facilities will be considered in the assessments. Information and data developed by the EIA technical and public involvement programs will be utilized by Manitoba Hydro in the planning, design and construction of the projects. The EIA programs and resulting impact statements are being designed to fulfill the environmental regulatory processes and to respond to current public expectations. The concept of sustainable development is embodied in the EIA programs.

Current forecasts indicate the Manitoba Hydro System will require additional energy sources by 1999. Several supply alternatives, including new generation, diversity exchanges, life extension of thermal plants and demand management are being evaluated. One option is construction of a hydro-electric generating station on the Nelson River at the Conawapa site. Additional transmission capacity (a third HVDC line - known as Bipole III) will be required to transport Conawapa's energy to southern distribution systems. A separate EIA program is being carried out for the Bipole III transmission project. The Manitoba Hydro Electric Board will select a means to meet future energy requirements in the next 12 months.

A large, long term construction project such as the Conawapa Generating Station has implications for many components of the Manitoba economy and particularly for the residents and communities in the vicinity of the project. While Manitoba Hydro is the project proponent and responsible for the technical aspects of the project, government agencies may become involved in social and economic programs following commitment to con-

struction. The EIA work plan presented in this document describes the schedule for and extent of EIA programs developed in the context of the current project plans.

The outlined EIA program may be modified in response to project schedules and designs, program findings, public input, and specific regulatory requirements.

This EIA Work Plan is presented in five sections:

- Background, objectives and scope of the Conawapa EIA program.
- Environmental regulatory processes which relate to the Conawapa project.
- Description of the Conawapa project including exploration, construction and operation activities.
- Proposed Conawapa EIA program including discipline activities, review and approval schedules.
- Public participation activities.

1.1 Background

Conawapa will be the sixth hydro-electric generating station to be built on the Nelson River. It is located at a site 27 km (17 mi) downstream of the Limestone Generating Station currently under construction (Figure 1). The proposed station is similar in design concept to the Limestone, Long Spruce and Kettle Generating Stations on the Lower Nelson River; it is comprised of a concrete powerhouse and spillway with an earthfill dam completing river closure. The Conawapa forebay will be contained within the natural banks of the Nelson River. The station will be operated in concert with the upstream Nelson River stations with minimal forebay fluctuations but variable discharges.

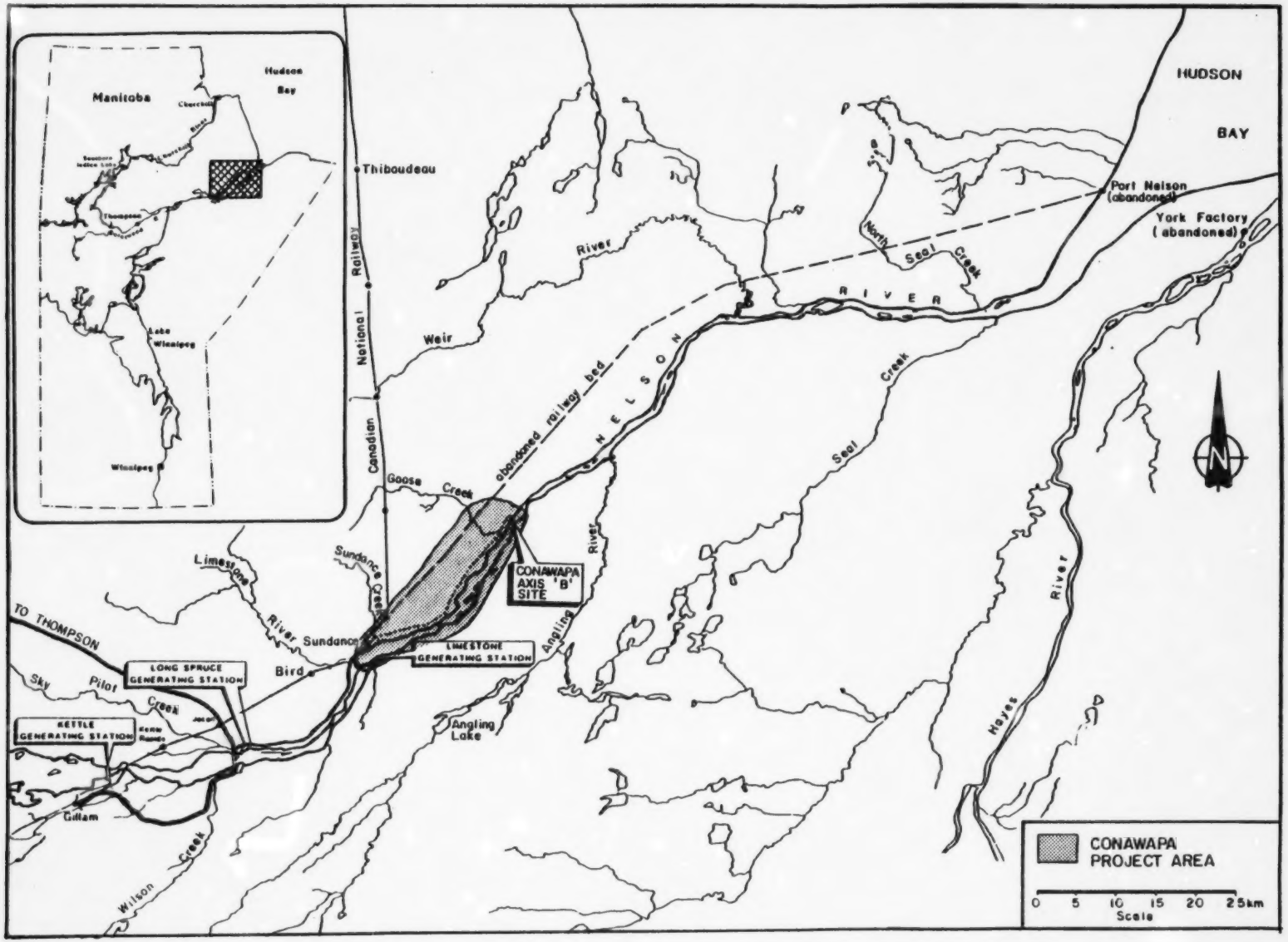

FIGURE I. CONAWAPA SITE LOCATION

Construction and environmental impact experience gained in developing previous stations contribute significantly to scoping and emphasis of the Conawapa EIA. Ongoing Impact Management Programs for the Limestone Project, initiated in 1985, provide information and concepts which are directly related to the Conawapa Project. The Limestone studies increased familiarity with the region, produced relevant data from monitoring activities, developed experience with construction practices and established continuing communication with local and regulatory interests. Topics to be considered in the conduct of this EIA program have also been identified through Manitoba Hydro's experience with diverse special interest groups such as the Fox Lake Indian Band, the Manitoba Fly Fishermen's Association and the LGD of Gillam.

Conawapa EIA programs have been initiated prior to the commitment to construct and commencement of construction thereby creating an opportunity for environmental considerations to be incorporated in project designs.

1.2 Objectives

The Conawapa EIA is being conducted to eventually secure Environment Act Licences in compliance with requirements of The Environment Act. Manitoba Hydro policy also requires that environmental impacts of Corporate activities be identified and appropriate measures be taken to mitigate adverse effects. Specific objectives to meet these goals include:

- identify and document physical, biological and socio-economic impacts of the project and determine how these impacts may affect the rights or interests of individuals and groups.
- involve the affected parties in a meaningful public participation program which will communicate project information and facilitate public involvement in developing impact management programs.
- design actions or programs to avoid or manage impacts.

- Develop programs to monitor impacts and assess effectiveness of mitigation programs.
- obtain timely approvals and licences as required for the project and its components.

The EIA work plan, accompanied by summary descriptions of the proposed development project and the regulatory review process, has been prepared to outline Manitoba Hydro's approach to achieving the stated objectives for the Conawapa Project. This work plan has been distributed to and reviewed by affected and interested individuals and groups, including regulatory agencies, in order that they can participate more effectively in the EIA programs.

1.3 Scope

The Conawapa project, as currently planned, is to provide first generation in 1999. In order to meet this in-service date, construction of certain infrastructure such as the permanent site access road is scheduled to begin late in 1989. Relevant regional environmental investigations were carried out in association with the Limestone project during the past five years and environmental studies directly related to Conawapa were initiated in 1988. Environmental impact studies and impact statements are scheduled to be completed for each component of the Conawapa project prior to commencement of construction of that component. The final Environmental Assessment Statement is to be completed and all environmental approvals obtained by mid 1991. Detailed schedules of environmental program activities and approvals are presented in Section 4 and Appendix I of this Work Plan.

The EIA investigations will encompass the remaining exploration and planning programs as well as construction and operation phases of the Conawapa Project. Major project components and activities include:

- exploration surveys and subsurface investigations;
- access road including stream crossings;
- camps and support facilities;

- borrow sites and haul roads;
- Stage I cofferdam;
- construction of the permanent works including generating station and dam;
- construction power and collector transmission lines.

The geographic scope of the physical and biological components of the EIA is restricted to areas that may be physically affected by the Conawapa Project facilities and activities. These include the Nelson River and its tributary drainages from the Limestone Station downstream to Hudson Bay. EIA socio-economic studies will focus on the local communities of Gillam, Bird and Sundance. Broader regional issues such as employment and economic benefits will be addressed in concert with other responsible agencies. Project justification and need are not considered in the Environment Act reviews but Manitoba Hydro has committed to provide development plans, schedules and costs to the Public Utilities Board for public review and discussions in the fall of 1989.

The Conawapa EIA is being conducted to comply with established processes of the Province of Manitoba. However, technical and procedural criteria of the Federal EIA process are also recognized in the Conawapa environmental programs. The concerns of affected individuals and groups are to be considered and addressed in the course of the EIA programs and reviews. These concerns will be resolved, as early and in so far as possible, with the affected party. Such interactions will be documented in the EIA reports. The following chapter of this work plan describes the EIA regulatory processes which apply to this project.

2. REGULATORY PROCESSES

2.1 Introduction

There are currently two provincial environmental review processes for development projects undertaken in Manitoba. During planning phases, projects proposed by Government Departments and Crown Corporations are subjected to multi-departmental review under the authority of the Inter-departmental Planning Board (IPB) administered by the Department of Rural Development. This agency reports to the Provincial Land Use Committee of Cabinet (PLUC) which approves project concepts. Once a project is committed the proponent is required to obtain an Environment Licence (or an exemption from an Environment Licence) in accordance with provisions of the Manitoba Environment Act proclaimed in 1988. This Act, administered by the Department of Environment, also involves multi-departmental review and approval as well as public involvement.

As the Conawapa project has a lengthy development time it is being reviewed by both processes as the project progresses from planning phase to construction phase. Insofar as possible, authorities responsible for the two review processes and the project proponent ensure that the process requirements are complimentary, that duplication is avoided and that transition from one process to the other is smooth. Many departmental interests continue throughout the project phases providing continuity from the IPB process to the Environment Act Licencing.

The Manitoba environmental review and approval processes recognize federal jurisdiction, interests and concerns. Representatives of federal agencies are involved in the Conawapa review and approval programs as well as providing technical support for provincial agencies. Manitoba agencies recognize appropriate federal criteria and standards, to avoid duplication of regulatory requirements. The Conawapa EIA team is

consulting with federal agencies and individuals and will present findings in a suitable format to satisfy requirements of both levels of government.

2.2 Interdepartmental Planning Board

A multi-agency Technical Advisory Committee (TAC) is established under the IPB process to review environmental plans, activities and results prior to project commitment. The TAC meets with and advises the project proponent regarding compliance with regulatory requirements and individual Departmental objectives as well as providing an effective means of information exchange. The TAC reports to IPB which makes recommendations to PLUC as appropriate.

Manitoba Hydro's environmental programs for the Limestone Project were reviewed and approved under the IPB/PLUC process existing under the Planning Act prior to the proclamation of The Environment Act. The TAC established for Limestone has continued to review the annual impact management programs and results. In 1987 this TAC had its mandate expanded to include other Lower Nelson River developments including Conawapa. This decision was taken in recognition of the overlap between Limestone and Conawapa environmental programs and in anticipation of the commencement of specific Conawapa activities.

The concept of Conawapa environmental programs was presented to the TAC late in 1987; a detailed environmental work plan was requested by TAC prior to initiation of formal environmental impact assessment activities. In the interim the TAC Chairman and appropriate Departmental officials have been informed of ongoing environmental and project investigations.

Although the IPB/PLUC process does not include public involvement programs, Manitoba Hydro will be discussing the project, its impacts and the regulatory approval process with affected and interested parties. The work plan will form a basis for initiating those discussions.

The work plan is being reviewed and approved by the Lower Nelson River TAC as the outline for the Conawapa EIA, required for future Environment Act licencing. It is recognized that additional concerns and issues may arise as the level of detail for the project increases, as findings of environmental programs become available and in response to public involvement programs.

2.3 Environment Act

When Manitoba Hydro commits to the Conawapa Project, decisions will be made regarding the timing for invoking the Environment Act licencing process. A general project description will be submitted to the Department of Environment. Specific component proposals will be presented individually for licences prior to commencement of construction. The Act makes provision for such a staged review and approval process.

Submissions are to be placed on a public registry and circulated within government for inter-departmental review and comment. For projects such as Conawapa, it is intended that the previously assembled TAC will participate in the Departmental reviews. If deemed necessary by its nature or by expressed public concern the project may be reviewed through a public hearing. An assigned Environment Act official uses responses to the proposal to prepare the Environment Licence which may contain conditions regarding further information requirements, construction constraints and monitoring programs. Under the identified process the proponent can appeal conditions of the Licence.

The current project schedule (1999 in-service) calls for EIA activities to commence and for the first submissions in 1989. The final EIA report would be submitted in 1990 for review and approval prior to commencement of major project activities which begin in 1991 or 1992. This schedule includes time for public hearings on the major project components, if such are required.

Ancillary project components such as the access road, construction power line and site preparation are currently scheduled for commencement prior to the 1990 EIA completion. These project components require separate environmental licences under The Environment Act and therefore would have individual environmental assessments. The Conawapa environmental programs undertaken in 1988 were designed to provide information to meet these anticipated licencing requirements in 1989 in order to maintain the current project schedule.

The Environment Licence does not exempt the proponent from other applicable Provincial and Federal regulatory requirements. Crown Lands permits, Natural Resources work permits, Navigable Waters Licences and Heritage Resources clearances must be obtained. Obligations under the Fisheries Act, the Public Health Act and the Dangerous Goods Transportation Act must be met. In total there are more than 100 Acts and Regulations which address environmental concerns in Manitoba.

In order to meet conditions of the Environmental Act, the EIA report will describe the proposed project, the environment and social setting. All areas of concern and study will be described along with analysis of potential impacts on the environment. Results will identify the following:

- potential short and long term impacts and their duration;
- potential impacts which can be eliminated, reduced or enhanced through mitigation and a listing of potential mitigative measures for each impact;
- monitoring programs necessary to determine potential future impacts that cannot be identified or predicted at this time;
- residual impacts which cannot be mitigated or enhanced.

3. PROJECT DESCRIPTION

3.1 Introduction

Manitoba Hydro's planning studies have identified several generating sites on the lower Nelson River. Kettle and Long Spruce Stations were constructed in the 1970's and are in operation to meet system load requirements. The Limestone Generating Station, currently under construction, is scheduled to have its first unit in service in 1990. Conawapa, located 27 km (17 mi) downstream of Limestone, is currently identified as the next plant to be developed on the Nelson River. (Figures 1 and 2).

Manitoba Hydro currently forecasts that additional energy will be required in 1999 to meet expected system load requirements. It is anticipated that selection of means to supply this energy will be made by the Manitoba Hydro Electric Board late in 1989 or early 1990. Construction of a generating station at Conawapa is one option under consideration.

The proposed Conawapa Generating Station will be similar in structure to other lower Nelson generating stations with concrete powerhouse and spillway and earthfill dams completing the river closure. The forebay will be contained within the natural banks of the Nelson River. The station will be operated in a manner similar to and in concert with the other Lower Nelson Stations - i.e., with small forebay fluctuations even though discharges are variable.

Power generated at Conawapa will be transmitted to Henday Converter Station, near Limestone, for conversion to D.C. (direct current) before transmission to southern Manitoba.

The following sections of this project description reflect current plans for various components of the proposed Conawapa development including:

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MANITOBA HYDRO

CONAWAPA GENERATING STATION

AIR PHOTO MOSIAC SHOWING ACCESS ROAD,
138kV CONSTRUCTION POWER LINE AND
12kV DISTRIBUTION LINE

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- schedules;
- project activities - exploration, construction, and operation;
- access;
- site facilities;
- project workforce; and
- transmission lines between Conawapa and Henday.

More detailed project descriptions for individual components or activities will be prepared as required.

3.2 Schedule

The following schedule of planning and construction activities has been developed to achieve a 1999 in-service date for Conawapa.

1988 -
- Complete environmental study design
- Conduct site specific exploration programs
- Initiate basic biophysical studies
- Identify preferred access road and transmission line corridor
- Commence environmental investigations and assessments
- Commence access road design programs including stream crossings
- Prepare specification and tender documents for test excavation and grouting program

1989 -
- Obtain environmental acceptance for test excavation and grouting activities
- Conduct test excavation and grouting programs
- Continue construction materials exploration programs
- Continue subsurface exploration programs along station axis

- Prepare site infrastructure
- Initiate environmental inspection program
- Complete access road, and submit construction powerline and site improvement environmental assessments
- Obtain licences for access road construction, construction powerline siting and site improvements
- Award contracts for access road construction
- Prepare logistics for construction of access road; commence clearing and construction
- Commence Conawapa-Henday transmission line route selection and design program
- Complete environmental assessment for remaining project components (i.e. Conawapa-Henday transmission line, cofferdam, generating station and construction facilities)

1990 - Construct access road
- Award contract for site improvement and camp construction
- Commence site preparation and camp construction
- Submit final environmental assessment reports
- Commence impact management programs
- Commence construction of construction power transmission line
- Call for tenders and award contract for construction of Stage I cofferdam and for North Shore excavation

1991 - Complete construction power transmission line
- Commence cofferdam construction
- Receive final Environment Licence

1992 - Prepare specification and tender documents for General Civil Contract
- Commence excavation of borrow areas

1993 - Complete construction of cofferdam
- Call for tenders and award General Civil Contract

1994 - Commence concrete placement

1997 - Commence Stage II diversion

1998 - Complete construction of transmission line between Conawapa and Henday

1999 - First unit in-service

2001 - Last unit in-service

The immediate tasks scheduled for the environmental and socio-economic components of the project are identified as follows:

- Impact management for 1989 test excavation and grouting program.

- Submission of the draft Environmental Work Plan to the Provincial Technical Advisory Committee and other interested parties for review and comment.

- Continue environmental planning and assessment programs initiated in 1988.

3.3 Project Activities

3.3.1 Exploration Programs

Exploration activities relating to the Nelson River developments in general and to the Conawapa project in particular, continue to be undertaken to provide necessary planning and project design information. These programs include various hydraulic and geotechnical investigations:

- topographic and location surveys
- hydrology and hydraulic studies
- surficial materials mapping
- location of project support facility sites
- sampling, identification and testing of granular, impervious and quarried bedrock construction materials
- description of foundation conditions

Several recent investigations were carried out to provide additional design information for the Conawapa project. A proposed access road route was identified on the ground to aid road design and assessment by interested parties. Bedrock formations and alluvium deposits in the riverbed in the vicinity of the proposed Conawapa site were investigated during periods of low flow. Summer and winter drilling programs were undertaken to investigate the river bed and bedrock formations in the vicinity of the proposed station axis, the foundation materials in the proposed transmission line corridor, and streambank materials at proposed road crossings. Test pits were excavated in identified granular and impervious deposits as well as in surficial limestone formations at the proposed site. Additional topographic surveys were carried out along the proposed access road route. All programs were reviewed by the Sundance Natural Resources Officer and conducted in compliance with issued work permits.

Test excavation and grouting programs are being undertaken in 1989 to further define foundation bedrock and to assess the effectiveness of grouting programs to deal with the pervious nature of the limestone formations. This program is described in detail in a project description document entitled Conawapa Axis B Exploration Programs - 1989 Test Excavation and Grouting. The Department of Environment, Department of Natural Resources and other agencies reviewed the proposed activity prior to commencement and issued approvals to proceed. Relevant environmental requirements are being enforced by the appropriate authorities. In addition, there will be further investiga-

tions of subsurface materials along the axis of the proposed generating station and dam including both abutments and across the Nelson River channel.

3.3.2 Access Road

Temporary access to the Conawapa project area in past winters was gained along winter trails to facilitate exploration programs. In the winter of 1988/89, a winter road was required to provide access for material, equipment and structures to undertake additional exploration work during the 1989 summer season. A similar winter road is proposed for the 1989/90 winter season. All-weather road access to site has been scheduled for late in 1990 to facilitate site preparation for construction programs (Figure 2). In order to meet this target, construction of the road and its major stream crossings will begin in late 1989. The winter and permanent access roads will be designed by the Manitoba Department of Highways. Winter roads are constructed by the Department of Highways while the permanent road will be constructed by Manitoba Hydro to Department of Highways' specifications. Manitoba Hydro's contractors will maintain the roads for the duration of Conawapa exploration and construction programs.

As the access road design and construction schedules require environmental assessment prior to the anticipated completion of the broader Conawapa environmental studies, environmental programs specific to the access road were initiated in 1988. The work included site specific field investigation and preparation of conceptual plans for the road and stream crossings along the proposed route. Environmental considerations have been factored into the conceptual plans through discussions between Manitoba Hydro, Highways Department, the Consultants responsible for stream crossing designs and Fisheries Branch representatives. Final design specifications will address engineering and environmental concerns such as fish passage through, and habitat protection at, stream crossings, borrow area development, construction practices and erosion protection.

Responsibility for the access road environmental programs and formal approvals rests with Manitoba Hydro. A proposal including an Environmental Impact Assessment report, to obtain an Environment Licence for the road will be submitted in August, 1989. It is also expected that the local Natural Resources Officer will issue and enforce work permits stipulating the specifications to manage environmental impact of the road.

One of the major concerns associated with development of the road is the increased access it provides to previously remote areas such as the Cape Churchill Wildlife Management Area, the Hudson Bay coast and York Factory site.

3.3.3 Construction Power Transmission Lines, Collector Transmission Lines

The Conawapa site requires electrical power service for exploration and construction programs.

Electrical power during exploration programs has been provided by on-site diesel generators. The 1989 test excavation and grouting program is serviced by a low voltage (12 kV) line from Limestone. This wood pole line has been routed, for most of its length, in the proposed access road corridor. Power during construction of the generating station will be provided by pre-building the permanent Limestone-Conawapa emergency power supply at either 138 kV or 230 kV. This line is also proposed to be mainly routed adjacent the access road; the 12 kV line is to be removed once the generating station is in service.

The permanent Conawapa-Henday collector transmission system will include four 230 kV transmission lines. Some of these lines are required to be available to provide a back-up interconnection during river diversion in 1997; scheduled in-service for Conawapa transmission is 1999. A project description, siting study and environmental assessment of these transmission lines will be submitted for environmental licencing.

Transmission design and construction activities will involve all interested parties as is currently occurring with the access road. Natural Resources work permits will be obtained and followed as required for construction and operation programs.

Conawapa power will be moved from Henday to southern Manitoba by means of a new high voltage Direct Current transmission line. This project, Bipole III Transmission, is the subject of a separate environmental siting and impact assessment study. This program is being conducted in parallel with but independent from the Conawapa environmental programs.

3.3.4 Construction Site Facilities

The Conawapa project site is planned to include site facilities similar to those at the Limestone project. The site layout will include two main components - the camp support facilities area and the construction area.

The construction camp will house construction workers for the duration of the project and will provide the following services:

- accommodation and dining facilities
- recreation facilities
- counselling and educational services
- health care services
- commissary and postal service

The construction site will be laid out in a work efficient manner and will include:

- Manitoba Hydro and Contractor's offices
- Manitoba Hydro and Contractor's work areas
- concrete batch plant and aggregate processing and storage areas

- materials and equipment off-loading facilities and storage yards
- construction site(s)
- fuel storage

Additional facilities servicing the work site and camp will include:

- helicopter pad
- security services
- communication tower
- water supply and treatment plant
- sewage treatment plant
- waste disposal site

There will be no rail access to the construction site; all equipment and materials will be trucked in from existing rail terminal facilities at Limestone or directly from suppliers. Air service will utilize the Gillam Airport; bus service will connect to the Conawapa site.

3.3.5 Personnel and Accommodations

Conawapa project personnel, including exploration and site preparation teams, will be housed in a fully serviced on-site camp. The temporary community of Sundance will be maintained for some personnel employed by Manitoba Hydro and the contractor. The necessary accommodation, recreational, and social support services will be available at both locations.

Currently, it is expected that the Conawapa camp will operate for nine years with a peak population of approximately 2,000 workers.

3.3.6 Construction Materials

Potential sources of construction materials for the Conawapa project have been identified and described by Manitoba Hydro exploration programs undertaken and reported in past years (Figure 2). Final selection of materials sources will be the responsibility of the Contractors, subject to Manitoba Hydro approval. Necessary volumes of granitic rock for concrete aggregate and other high durability requirements will be obtained from either of two quarries in the Nelson River immediately downstream of the Limestone Station.

In all instances preparation, operation, and reclamation of the borrow areas (and construction site) will be undertaken in compliance with relevant regulations and accepted standards of practice. Borrow area management and reclamation programs conducted at Limestone provide a positive model for future operations. It is known, for example, that surficial disturbance, vegetation clearing, or water course alterations will require specific work permits from the local Natural Resources Officer who will carry out inspection and enforcement.

3.3.7 Materials, Equipment, and Personnel Transport

All construction materials and equipment will be hauled to site by truck. Materials shipped by rail to Limestone will be transferred and trucked to site.

Personnel will travel to site by road with project bus service provided between the site and the Gillam Airport. Commercial bus service via Thompson will also be available to and from the site.

3.3.8 Station Operation

The Conawapa Generating Station is expected to operate in a mode similar to the other Lower Nelson stations. It will be a run-of-the-river plant

with relatively short term reservoir storage, minimal reservoir fluctuations, and a variable discharge pattern in response to load requirements.

Reservoir winter ice covers will be stable while the river reach immediately downstream of the station will remain ice free as has occurred with other Lower Nelson River plants.

Permanent support facilities to be established at Conawapa will include a staff house, vehicle and equipment storage and construction maintenance materials stockpiles.

3.3.9 Environmental Programs

Environmental considerations and programs are an integral part of the Conawapa project. Project exploration, planning, construction and operation phases include environmental components and activities. Environmental assessment and mitigation of project impacts are being undertaken in accordance with Corporate Policies and regulatory requirements. Many environmental impact management and monitoring programs carried out for the Limestone project extend into the Conawapa project area. Where appropriate, these programs are being continued to address Conawapa project concerns.

The Conawapa project, including the various activities associated with each project phase and components are subject to licencing under The Manitoba Environment Act (1988). Processes and requirements of the Act are the basis for the project environmental assessment programs. Additional environmental considerations arise from project design requirements, from public and special interest concerns and from recognized standards of environmental practice with licencing and regulatory review programs continuing throughout the project duration. In the Lower Nelson area, heritage fish species, fish habitat protection and local

employment/business opportunities have been identified as key concerns. Public consultation, information exchange, impact management and monitoring are also ongoing commitments.

Environmental inspection including activity planning and compliance monitoring are to be undertaken by both the project proponent and local regulatory authorities. Local Natural Resource Officers from the Regional Services Branch of the Manitoba Department of Natural Resources are particularly effective in dealing with site specific environmental disturbance activities such as those associated with borrow areas, access roads and drainage management.

These personnel have also performed significant services in environmental education and enforcement relating to project staff, temporary residents and established local communities.

4. WORK PROGRAM

4.1 Environmental Setting

The Conawapa project area is part of the Hudson Bay Lowlands, a region characterized by emerged marine clays, silts and sands deposited as level plains, with low beach remnants present on both sides of the Nelson River near the mouth of Angling River. Glacial deposits in the form of morainal, meltwater, and glacio-fluvial features have been identified in only a few places.

Organic soils associated with bogs and fens predominate on level, poorly drained lands, with widespread discontinuous permafrost in raised bogs such as peat plateaus. Soils developed from alluvial and marine sediments occupy the banks and channels of the Nelson River and most of its tributaries.

The project area is drained by numerous small creeks that empty into the Nelson River or its tributaries, including Sundance, Beaver, Goose, Swift and Tiny Creeks. Several named drainages between Limestone Generating Station and the proposed Conawapa Station, although small in terms of reach, are also notable for their well-defined channels and eroded slopes, which are particularly evident near their mouths.

Vegetation of the Hudson Bay Lowlands consists primarily of open black spruce and tamarack stands growing on poorly drained bogs and fens, with Sphagnum, lichen and Labrador Tea dominating the understory and ground cover. Better drained alluvial and beach deposits support white and black spruce, balsam fir, trembling aspen, balsam poplar, and white birch.

Density and diversity of wildlife are generally low in the project area. Wildlife species include upland game birds such as ruffed, sharp-tailed, and spruce grouse, and ptarmigan; furbearers such as fisher,

pine marten, beaver, mink, muskrat, otter, red fox, lynx, wolf and short-tailed weasel; large ungulates, such as moose and woodland caribou; and black bear.

A total of 33 species of freshwater fish are known to occur in the Lower Nelson River. Of these species, brook trout and lake sturgeon are considered heritage species by the Province of Manitoba. Other species include northern pike, lake whitefish, walleye and sauger but not in quantities sufficient for commercial harvesting. The most abundant species in the area are longnose suckers and lake whitefish.

Of the six creeks crossed by the proposed road, Swift, Tiny, Goose and 15 Creeks are important nursery areas to a wide variety of fish including brook trout and Beaver Creek is an important brook trout nursery.

Communities within the project region but not in the project area are Gillam, Bird and Sundance. The abandoned town of Port Nelson and the National Historic Site of York Factory are situated at the Nelson River/Hayes River estuary. All of the project area is within the Manitoba Hydro Water Power Reserve. The project area is also within the southern portion of the Cape Churchill Wildlife Management Area.

4.2 Purpose

In order to effectively carry out an environmental impact assessment, a detailed work program must be developed. Ideally, the work program requires a detailed project description in order to identify the majority of potential resource impacts which may occur as a result of the development. It is also recognized that the work program may be modified during environmental investigations. Changes in the program generally result from new study findings which may alter the significance of potential impacts. In this fashion, the study program remains dynamic enough to accommodate future emphasis change.

The purpose of the Work Plan is to guide the investigation throughout the study. It is also used as a reference document which can be reviewed by other interest groups to supply additional inputs to the work program or to monitor the EIA process.

In the case of the proposed Conawapa development, a completed, detailed, project description was not available when the initial environmental work was undertaken in 1988.

The initial Environmental Work Outline was therefore developed on the basis of a preliminary project description. The major components of the project had been described, however some specific location and design features for the all weather road, transmission line and camp sites were not finalized. Rather than wait for final designs, the decision was made to proceed with initial EIA investigations in areas where generic information would be collected regardless of design change.

Other factors also indicated a need for preliminary investigations. Baseline information on the Nelson River estuary was non-existent. As such, research and investigations in the lower reaches of the river were started in late spring to obtain one full year (each of the seasons) of baseline data. Similar rationale was used to develop programs to obtain data on coastal wildlife staging and migration. Since potential borrow and construction sites and road right-of-way had been identified, archaeological investigations were carried out on these areas. This ensured any archaeological findings or sites would be preserved, use restricted, or worked prior to any disturbance from exploration or construction programs.

Finally, the task of identifying and evaluating existing resource data and information could be carried out prior to design completion through literature reviews. Contacts could be established, vested interest groups identified and existing data gaps determined. All the foregoing would aid in the development of the refined final work program.

These studies, initiated in June 1988 as outlined in a preliminary work plan were modified as more precise project designs became available for some components and as field information indicated changes in the scope of the work.

4.3 Work Carried Out

The following paragraphs summarize the work carried out in 1988 and the results achieved in each resource sector prior to development of this detailed Work Plan. The results of course are not conclusive in all cases but will be at the conclusion of the study.

4.3.1 Physical Resources

This resource sector includes an assessment of ground and surface water, soils, aggregate, permafrost and weather. The following investigations have been carried out in part:

- The Penner Report on the Lower Nelson River has been reviewed and summarized with respect to shoreline and reservoir erosion.
- Proposed aggregate budgets for construction of the Conawapa generating station have been developed.
- The Newberry Report (Thesis) on the Lower Nelson River ice regime has been reviewed.
- Applicable reports and work with respect to the Lower Nelson river ice regime have been identified for review.
- A general reconnaissance of the area has been carried out.
- An historical review of the Nelson River estuary and Port Nelson has been carried out in relation to physical conditions.
- The transmission line corridor between Henday and Conawapa and the Conawapa access road route have been ground truthed.

4.3.2 Terrestrial and Wildlife Resources

This sector includes an assessment of the flora and fauna on the lands surrounding the reservoir and project area, and downstream of the Nelson River including the estuary and associated marine mammals.

A summary of activities carried out in this sector is as follows:

- Field investigation of the Conawapa access road and the transmission line alignment have been carried out and a preliminary assessment of construction impacts on vegetation and wildlife has been made.
- Literature reviews have been carried out including; the Lower Nelson River Studies; habitat and biological characteristics of beluga whales and seals; biophysical studies for the area; distribution and production for the Canada Goose Eastern Prairie Population.
- Spring, summer and fall surveys along the Nelson River and estuary were carried out for waterfowl, raptors, caribou, black bears, shorebirds, seals, and shoreland habitats and vegetation.
- Numerous government agency contacts were established.
- Interpretation/mapping of shoreland vegetation and habitats on the reservoir shoreline of Conawapa was carried out.

4.3.3 Fisheries Resources

This sector includes an assessment of development impacts on fish and aquatic invertebrates in the Nelson River, all stream tributaries connecting to the reservoir and the Nelson River estuary. Considerable effort was expended on estuarine studies because recent baseline data did not exist. Considerable work was also carried out on the reservoir tributary streams in relation to the Conawapa access road. The purpose of this effort was to supply the road designers with information relating to sensitive environmental concerns which would possibly be

eliminated or reduced through engineering design (eg. stream crossing concerns).

The following is a summary of tasks carried out prior to the development of this Work Plan.

- o All Conawapa access road stream crossings were evaluated according to the Manitoba Stream Crossing Guidelines and were ground truthed. Site descriptions were made and fisheries concerns were outlined for each stream crossing. These were submitted to the access road designers.
- o Ground truthing was completed and impact evaluations were made for the Conawapa/Henday transmission line corridor.
- o A literature review of generating station impacts on the Nelson River was done but found to be of little value in predicting upstream and downstream fish movements.
- o A preliminary spring survey and complete summer and late fall surveys were conducted on the Nelson River estuary. Prior to these surveys, virtually no work had been conducted within the estuary. The program was designed to provide a general, overall assessment of the aquatic resources of the estuary. Examination of possible relationships between water chemistry, benthic and planktonic invertebrate communities and fisheries resources, including observations on marine mammal populations was carried out. This assessment was performed in the riverine, estuarine and near shore marine zones of the Nelson River estuary. The majority of results (water chemistry and fisheries) are based on analysis of data from each of spring, summer and fall field surveys. Results from the invertebrate data are currently based only on the summer survey.

4.3.4 Socio-Economic Resources

Other than casual meetings of some key persons in the study area by study team members conducting field investigation, the socio-economic study was not started prior to the development of this Work Plan.

4.3.5 Heritage Resources

All of the immediate potential disturbance areas on the north side of the Nelson River have been investigated for historic resources. This was done to ensure that exploration programs in areas allocated to transmission lines, the access road, any preliminary camp sites, borrow areas or any other areas which may be potentially disturbed would not impact historic resources. The first season's investigations were carried out in accordance with provincial guidelines and no historic resource sites were identified although extensive areas were surveyed. A report on these field investigations has been submitted to the Historic Resources Branch in the required format.

4.4 Work Proposed and Schedule

An outline of the Conawapa EIA Work Plan and Schedule for the complete project is presented in Appendix I. This section presents a summary of the detailed tasks required to complete the Conawapa EIA. The summary headings follow the order presented in Phase II of the Work Plan and Schedule. This summary does not attempt to present lengthy detail or predict potential changes in emphasis of the work which may evolve as a result of new findings and emphasis changes.

Detail given in this Work Plan reflects the relative importance of areas of highest potential impact and does not imply that thorough study in all areas will not be carried out by the omission of detail in this Work Plan Summary.

A. PHYSICAL STUDIES

1. Reservoir Erosion

- o Determine flooded areas on forebay rim, identify sensitive areas, compare with Penner's classification, identify areas requiring reclassification.
- o Field reconnaissance of areas requiring reclassification and where ice-rich soils may exist and, soil sampling for erosion effects on water quality.
- o Review Manitoba Hydro's soil log-hole data and assess adequacy of impact predictions where ice-rich soils exist; predict impacts on Conawapa reservoir.
- o In conjunction with Manitoba Hydro's exploration programs, develop and supervise a small-scale drilling program to assess ice content of ice-rich soils beyond existing bowl-shaped depressions.
- o Develop monitoring program and schedule for Conawapa reservoir.
- o Draft sections of report and prepare maps.
- o Review by Manitoba Hydro.

2. Granular and Quarrying

- o Compare aggregate requirements of Conawapa versus Limestone to determine the accuracy of previous needs estimates.
- o Assess borrow locations in field with respect to environmental requirements.
- o Assess the impact of borrow removal and their relationship to local aquifers near important streams.
- o Develop guidelines for general borrow pit operations, including dewatering waste rock disposal areas, rehabilitation, and future use.
- o Prepare maps and draft text.
- o Review by Manitoba Hydro.

3. Ice Regime

- o View Manitoba Hydro's videos of past years experience and field reconnaissance of Lower Nelson Ice Regime.
- o Review Manitoba Hydro's operational experience at Long Spruce; construction experience at Limestone; and predict ice effects at Conawapa and on estuary.
- o Draft report section on Ice Regime.
- o Review by Manitoba Hydro.

4. Water Regime

- o Collect historic Conawapa flow data, and prepare a summary of historic flows versus flows under present development, versus flows with Conawapa. Summarize changes to water regime as a consequence of Conawapa, with emphasis on the estuary.
- o Research and predict other impacts to water regime as related to temperature and chemical composition.
- o Prepare graphs, draft report section.
- o Review by Manitoba Hydro.

5. Estuary

- o Reconnaissance of estuary, complete historical documentation of physical descriptions of the estuary, and rationalize field observations with historical descriptions.
- o Assess impacts of Conawapa on the estuary, draft report and prepare maps.
- o Review by Manitoba Hydro.

B. TERRESTRIAL AND WILDLIFE STUDIES

GENERATING STATION IMPACTS

1. Shoreland Assessment

- Document relevant project characteristics (eg., forebay levels, seasonal fluctuations, daily/weekly/season discharge patterns, sediment loading, drainage outfalls, etc.) that will influence shoreland plant communities and habitats.
- Identify and map shoreline features and plant communities that would be affected by the forebay and changes in flow regime.
- Review existing resource data (continuation). Identify vegetation communities and habitats likely to be affected by the forebay based on discussion with resource agencies and evaluation of 1988 field studies. Delineate habitat, vegetation, flood contours, and shoreline classes on maps and airphotos.
- Review mapped information with resource specialists; verify and update.
- Revise mapped information; quantify changes in shoreland communities and habitats, estimate post-flooding effects caused by wave action, permafrost degradation, etc.
- Summarize and analyze shoreland changes in terms of their potential impact on animal populations, plant communities, and existing patterns of resource harvest; produce impact summary table.
- Identify impact management and mitigation measures/strategies in concert with fisheries, hydrology, and geotechnical staff; produce summary table on impact management. Review with Hydro and TAC, and revise impact management program.

2. Estuary Assessment

- o Evaluate those aspects of the Conawapa project that could affect estuarine and associated coastal areas inhabited by marine mammals, waterfowl/shore birds, polar bears, and caribou.

- o Continue literature review on (a) seal and beluga biology, including habitat requirements along the west coast of Hudson Bay; (b) staging migrating waterfowl, with emphasis on Canada Geese, Snow Geese, and Tundra Swans; (c) populations of woodland caribou that inhabit coastal flats from Cape Churchill to Cape Tatnam; (d) distribution of polar bears.

- o Produce a draft "summary document" on estuarine wildlife to serve as a basis for assessing impacts of improved access to the coast and determining impact management/mitigation strategies; and review summary document with agencies and researchers to verify content and identify data gaps.

- o Identify additional research (if any) required to adequately assess impacts of Conawapa, and to some extent, Gillam Island development.

- o Through data analysis and agency contacts, determine impacts on estuarine wildlife resources (and resource use, where applicable -- eg., goose hunting out of private lodges) associated with operation of the Conawapa Generating Station; produce impact summary table. Review with resource specialists and revise as required.

- o Identify impact management and mitigation measures/strategies in conjunction with fisheries staff. Review with Hydro, TAC, resource specialists, and other study team disciplines; produce mitigation summary table.

3. Facilities, Access, and Transmission Line Assessment

- o Consolidate information collected on vegetation communities and upland wildlife habitats during the 1988 field season; review their relationship to the updated project description to identify additional data gaps/requirements.

- o Identify and document specific impacts on vegetation, wildlife and wildlife use associated with construction and maintenance of the (a) proposed all weather road (b) connecting access, (c) gravel sources, and (d) camp and materials-storage sites and transmission line. Produce impact summary table.

- o Review impact summary with Hydro and agencies (including TAC); revise as required.

- o Identify impact management and mitigation measures/strategies in concert with fisheries, hydrology, and geotechnical staff; produce mitigation summary table. Review with Hydro and TAC.

- o Refine impact management and mitigation strategies; review with Hydro and TAC; revise as required.

4. Prepare Final Assessment

   - o Assessment to include environmental setting, impact assessment, and impact management/mitigation strategies.

C. FISHERIES STUDIES

1. Evaluate Access Road Impacts

2. Evaluate Transmission Line Impacts

   - o Stream crossing designs and Provincial Fisheries data will be reviewed and recommendations finalized in reports on each.

   - o Review by Manitoba Hydro.

3. Evaluate Generating Station Impacts

a) Fish Passage and Fish Culture/Hatchery Assessment

- o Recommendations made by Fisheries subcommittee to TAC on a variety of mitigative options including a hatchery, fish passaged devices and the evaluation of the present and potential brook trout fishery will be reviewed, assessed and summarized for inclusion in the final report.

b) Assessing quarrying impacts on fish at existing and potential quarry sites at the Limestone generating station in terms of blasting and dewatering.

c) Fish Assessment - Lower Nelson River

- o Unpublished data held by the Fisheries Branch will be reviewed, impacts on brook trout streams will be evaluated, potential impacts to fish life history requirements will be determined and data gaps will be identified
- o Appropriate technologies which allow for collection of this data will be determined.
- o Asses the potential impact of changes in groundwater and quality on important fish habitat in adjacent streams from the findings of Physical Resources investigations.
- o Impact management programs will be recommended in the final report

d) Downstream Flow/Level Variations

- o All pertinent information on the effects of flow/level variations in the system will be collected and reviewed. Potential impacts associated with flow/level variations will be determined from the literature and related to the fish species inhabiting the Lower Nelson River.

- The above information will be included in the final report.

e) Reservoir Area Assessment

- Changes which occur to biological environments during the transformation of riverine habitat to lacustrine habitat are well documented and will be reviewed in relation to Conawapa. The existing data base on the biological resources of the Lower Nelson River will be collated and reviewed.

- Geophysical information on the Conawapa system will be used to determine biophysical parameters, i.e. amount and type of shoreline which will be present after construction of the reservoir.

- Test netting duplicating 1985/86 Fisheries studies in Long Spruce reservoir and tagging will be carried out to determine changes in species composition of this established reservoir and in Limestone reservoir as it is raised to establish base river conditions all for impact predictions of Conawapa reservoir.

- From the foregoing, impacts will be identified in relation to:

  - changes in fish species and relative abundance, affect on brook trout and lake sturgeon populations;
  - species adaptability to the "lacustrine" environment;
  - changes in access to streams by fish populations, spawning and reproductive success, feeding behavior and diet, and primary and secondary production;
  - cumulative effects of the combined influence of Kettle, Long Spruce, Limestone and Conawapa reservoirs will be identified.

- Impact management programs will be developed.

- The above information will be presented in a report on the potential impacts of the generating station.

- Review by Manitoba Hydro.

4. Develop Estuary Data Base

The following activities will be conducted to complete the Nelson River estuary baseline studies:

- o Complete analysis of fish stomach contents, relationships between stomach contents and invertebrate communities, identification and analysis of benthic and planktonic samples and identification and enumeration of ichthyoplankton.

- o Evaluation of the relationship between water chemistry, invertebrate and fish population characteristics and fish diet.

- o Evaluation of the temporal relationship in water chemistry, fish and invertebrate communities, and completion of life history and population data evaluation for fish.

- o A final report will be produced detailing the baseline data collected from the Nelson River estuary.

- o Review by Manitoba Hydro.

5. Evaluate Fisheries Resource Use Impacts

a) Additional literature searches will be conducted to assess all published data from Kettle, Long Spruce and Limestone areas, unpublished information will be obtained, and existing management strategies for each species will be reviewed and evaluated. Potential impacts of new access to brook trout streams in this area will be investigated.

b) Where sufficient data exists the following will be determined:

- o Species composition of the domestic and sports fisheries will be examined and related to the type of fisherman (i.e. permanent resident, short-term resident or tourist).

- o Short-term impacts caused by an influx of construction workers at specific sites.

- o Long-term impacts associated with an increase in the number of permanent residents.
- o Positive impacts associated with increased access to additional sites and potential decrease in fishing pressure at existing fishing locations.
- o Percentage of the total catch by species taken by tourists. Short and long-term effects on the tourist industry caused by decreased catch-per-unit-effort.
- o Impact management will be recommended.

c) Studies will be identified to fill data gaps where sufficient data does not exist.

d) A report summarizing the above study components will be produced.

- o Review by Manitoba Hydro.

D. SOCIO-ECONOMIC STUDIES

1. Review Limestone Project Experience

The Limestone EIS documents (1985,1986) and Limestone Household Surveys (1895, 1987) will be reviewed in detail, particularly with a view to confirming those impacts which were predicted to occur and to identify any unexpected impacts. In addition, the effectiveness of mitigation and enhancement programs, and changes in them as perceived by residents, will be highlighted.

2., 3. and 4. Key Person Interview Program

Key person interviews will be conducted in Thompson (key provincial staff responsible for services to the Gillam area) and

the Local Area (representatives of government services, local government, Fox Lake Band, community organizations, businesses interest groups and other area users such as Parks Canada, recreationists and commercial operators). Objectives of the interviews are:

- cross-check documented experience from the Limestone project.
- identify perceived changes resulting from the Conawapa project.
- test any changes in mitigation and enhancement programs which may be required.
- test attitudes toward the Conawapa project.

Activities will include preparation of tailored interview questions, conducting 40 interviews in Thompson and the Local Area, and synthesizing results in a working paper on key person interviews. A local resident will be hired to assist with these interviews.

Proposed candidates for the interview program will include the Departments of Social Services and Corrections, Economic Security and Employment Services, Rural Development, and the Northern (formerly Limestone) Training and Employment Agency.

In the Local Area proposed candidates will include administrators in the LGD, schools, hospitals, CEIC Outreach office, RCMP, Social Services, health clinic, Natural Resource officers, recreation director, mayor of Gillam, Gillam Fur Council representative, Brook Trout Association representative, business people, long time residents, Chief/Councillors Fox Lake Band, elders and business people of Fox Lake Band (Gillam and Bird), on-site Manitoba Hydro staff and others as required.

Key persons will also be identified by selected community leaders (eg., Chief of Fox Lake Band, LGD Administrator) and possibly by others during the process.

5. Identify Impacts and Impact Management Requirements

Issues deemed to result in significant change, will be addressed separately, based on results of the Limestone experience and key person interview program. Estimates of socio-economic change, particularly in quantitative form, will be provided where possible.

Land and resource use issues with implications for local residents will be identified from the heritage resource, terrestrial, wildlife and fisheries studies. Where quantification of impact is possible, it will be undertaken. The meaning of these changes for local residents will be addressed in the interview program.

For issues predicted to have no significant change, characteristics and circumstances of the Limestone and Conawapa projects will be compared and, where differences are apparent, implications for these issues will be noted.

6. Recommendations will be developed for impact mitigation and enhancement programs where significant impacts are identified. These will include:

- continuation of existing programs;
- change in existing programs; and
- new programs, if required.

Results will be documented in a working paper for review by Hydro. This will form background information for the EIA.

The applicable findings of this program along with findings from other resource sectors regarding the potential overall impact of improved access to the Hudson Bay coast will be presented.

E. HERITAGE RESOURCE STUDIES

1. The archaeological/historic setting of the area will be reviewed and described for the Conawapa area including the estuary.

2. Field investigations will be carried out in summer 1989 on a number of areas that may be disturbed by exploration, roads, transmission lines and camps on the north side of the Nelson River. These sites are the remainder of potential development sites for borrow or other construction activity. Should an historic site be identified, Manitoba Hydro and the Historic Resources Branch will be immediately notified to ensure its preservation for further investigation.

3. Investigations will be carried out on the south side of the Nelson River at the Conawapa generating site at all potential exploration and construction sites.

4. A draft impact assessment report will be prepared and if there are any historic resources in the area, their management guidelines will be given.

5. A report suitable for the Historic Resources Branch will be prepared after the field season and submitted to that Branch.

5. PUBLIC PARTICIPATION AND REGULATORY LIAISON

5.1 Introduction

Current practices and regulatory processes require that the public which may be affected by development activities are informed, as early as possible in the project planning process, of potential effects on their lives and pursuits. For large public utility developments this obligation extends beyond the directly effected area to regional interests and the public at large, who are the shareholders of the utility. In addition to the need to inform affected and interested parties there is also an obligation to record and respond to expressed public concerns arising from the project.

The broad scope of large long term developments requires interaction with numerous regulatory and technical agencies. Ongoing contact with representatives of these agencies facilitates the regulatory review and approval process and develops familiarity with the project in question.

5.2 Public Participation

The public in the Conawapa project area have become familiar with hydro-electric developments through their experience over the past three decades with Kettle, Long Spruce and Limestone projects. They are generally aware of the Conawapa site and of Manitoba Hydro's intent to construct the Conawapa generating station at some point in time. Recent experience with the Limestone project has introduced the public to the environmental assessment process and identified areas of impact and opportunity. It is intended that the Limestone experience will be a productive basis for implementing the Conawapa Public Participation programs.

Manitoba Hydro representatives and members of the Conawapa study team will meet representatives of local government and administration,

special interest groups and concerned citizens to introduce them to the project and to solicit their experience and expectations. These groups will continue to be utilized as recipients/sources of information about the progress of the project as well as participating in review of study findings and proposed impact management and mitigation programs.

The following groups will be invited to review and comment on the EIA Work Plan and draft reports. Comments received will be carefully considered and as far as practicable incorporated into the final version of these documents. Records will be kept of all meetings held with representatives of these groups.

- Local groups (L.G.D. of Gillam Council, Fox Lake Band Council, Gillam Brook Trout Association, Gillam Fur Council); and
- Other interests (N.F.C, MKO, North East Development Association, City of Thompson, Manitoba Environmental Council, Manitoba Wildlife Federation, Mennonite Central Committee, etc.).

Manitoba Hydro will also be issuing press releases and project related information to the general public from time to time. The EIA and summary project information will be placed on the Department of Environment Public Registry for scrutiny by interested parties. The corporation will respond to informational enquiries and expressed public concerns.

5.3 Regulatory Liaison

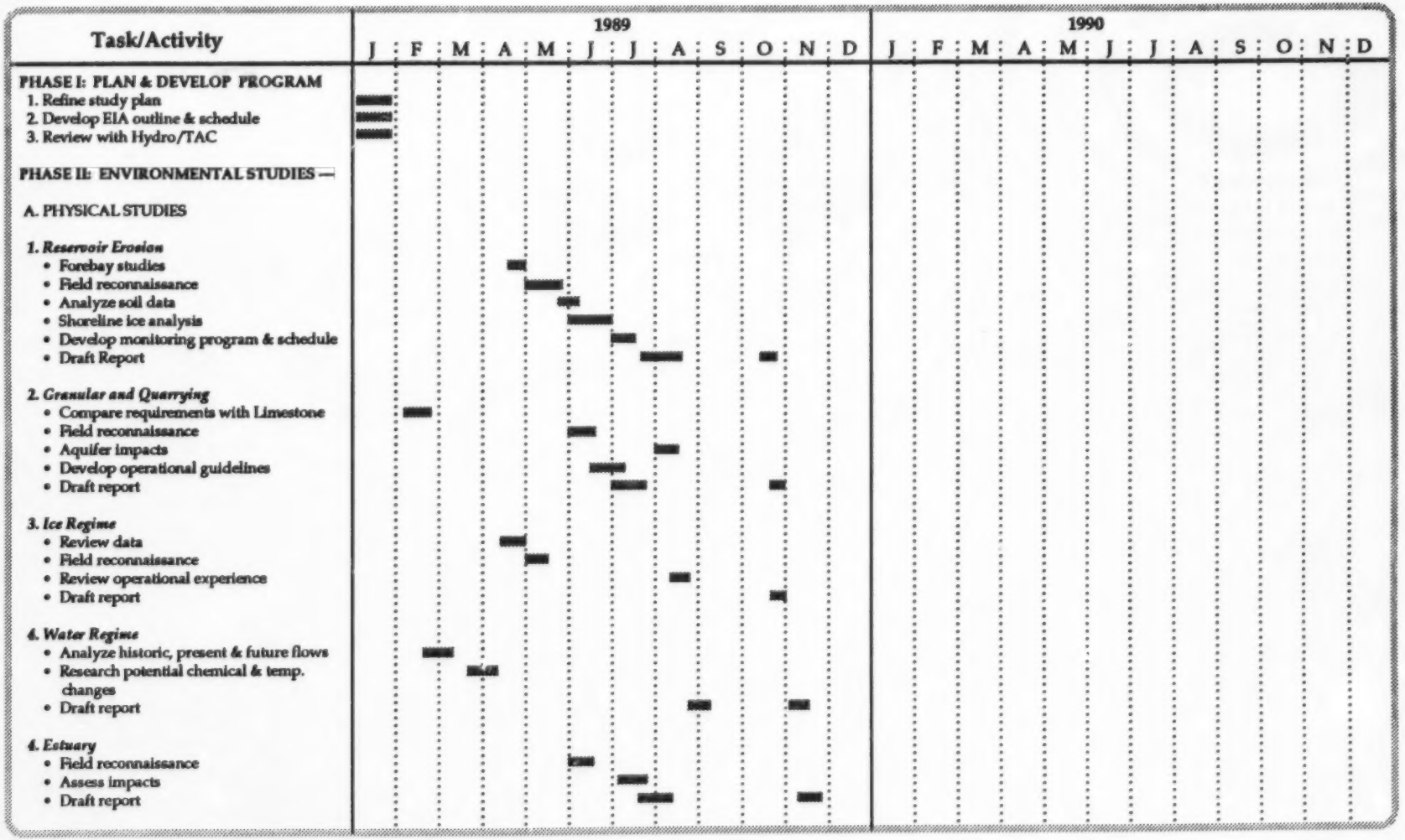
Ongoing project related and general investigations, particularly the Limestone Impact Management activities, have established strong working relationships between Manitoba Hydro and government technical and regulatory agencies. The liaison activities associated with the Conawapa project will build upon the prevailing positive relationships.

Throughout the course of the EIA program, Manitoba Hydro and the EIA Consultant Team will formally interact, mainly through meetings with the Conawapa Technical Advisory Committee to review work programs, results and the assessment process. There will be on-going liaison with officials of the Department of Environment, Department of Natural Resources and other agencies involved in Environment Act reviews as appropriate.

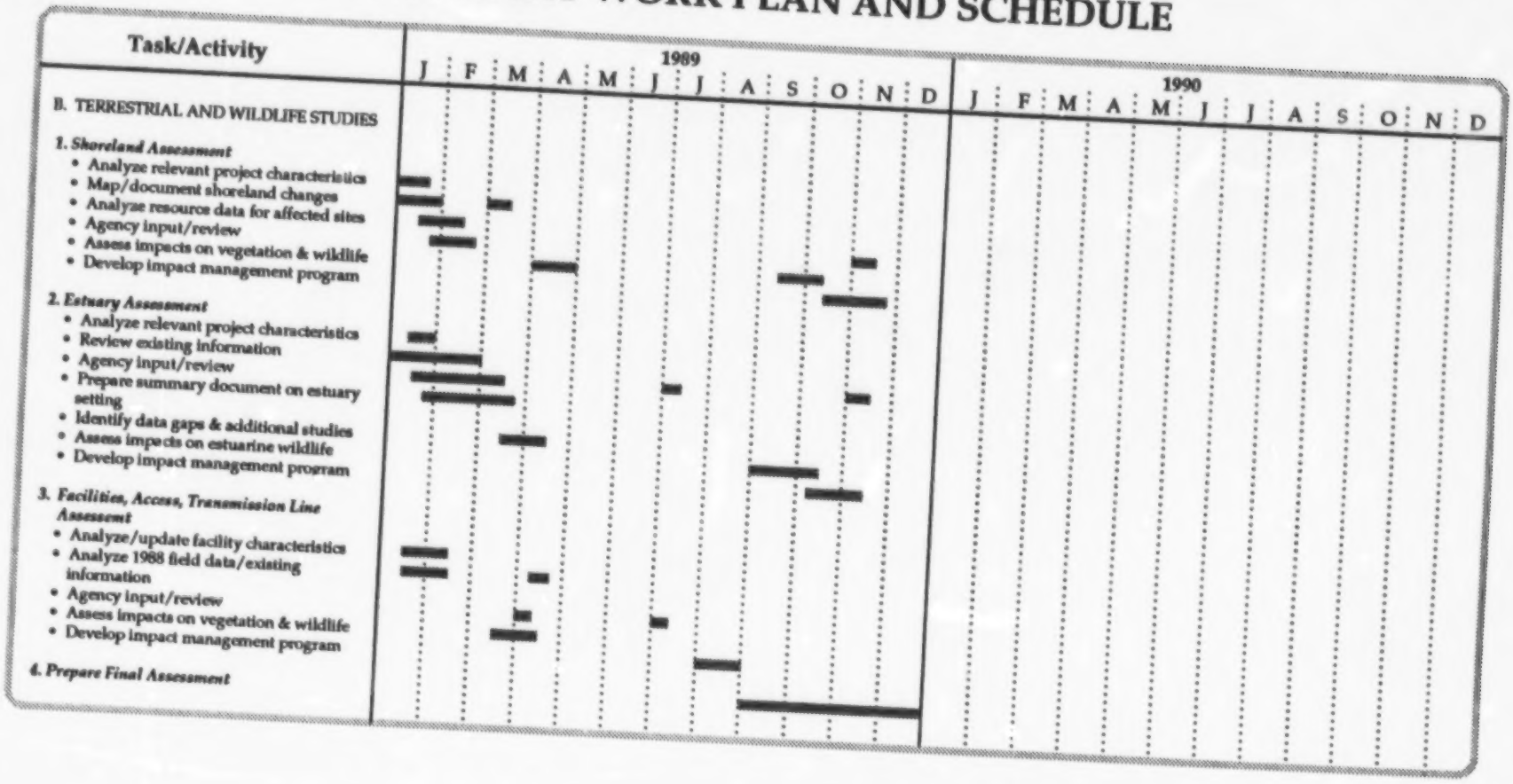
Contact will be maintained with discipline professionals and local resource agency personnel. Their input to discipline programs and expert review of draft reports and proposed plans will be encouraged.

APPENDIX

CONAWAPA WORK PLAN AND SCHEDULE


Task/Activity
1989
J F M A M J J A S O N D
1990
J F M A M J J A S O N D
PHASE I: PLAN & DEVELOP PROGRAM
1. Refine study plan
2. Develop EIA outline & schedule
3. Review with Hydro/TAC
PHASE II: ENVIRONMENTAL STUDIES —
A. PHYSICAL STUDIES
1. Reservoir Erosion
• Forebay studies
• Field reconnaissance
• Analyze soil data
• Shoreline ice analysis
• Develop monitoring program & schedule
• Draft Report
2. Granular and Quarrying
• Compare requirements with Limestone
• Field reconnaissance
• Aquifer impacts
• Develop operational guidelines
• Draft report
3. Ice Regime
• Review data
• Field reconnaissance
• Review operational experience
• Draft report
4. Water Regime
• Analyze historic, present & future flows
• Research potential chemical & temp. changes
• Draft report
4. Estuary
• Field reconnaissance
• Assess impacts
• Draft report

CONAWAPA WORK PLAN AND SCHEDULE


Task/Activity
1989
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1990
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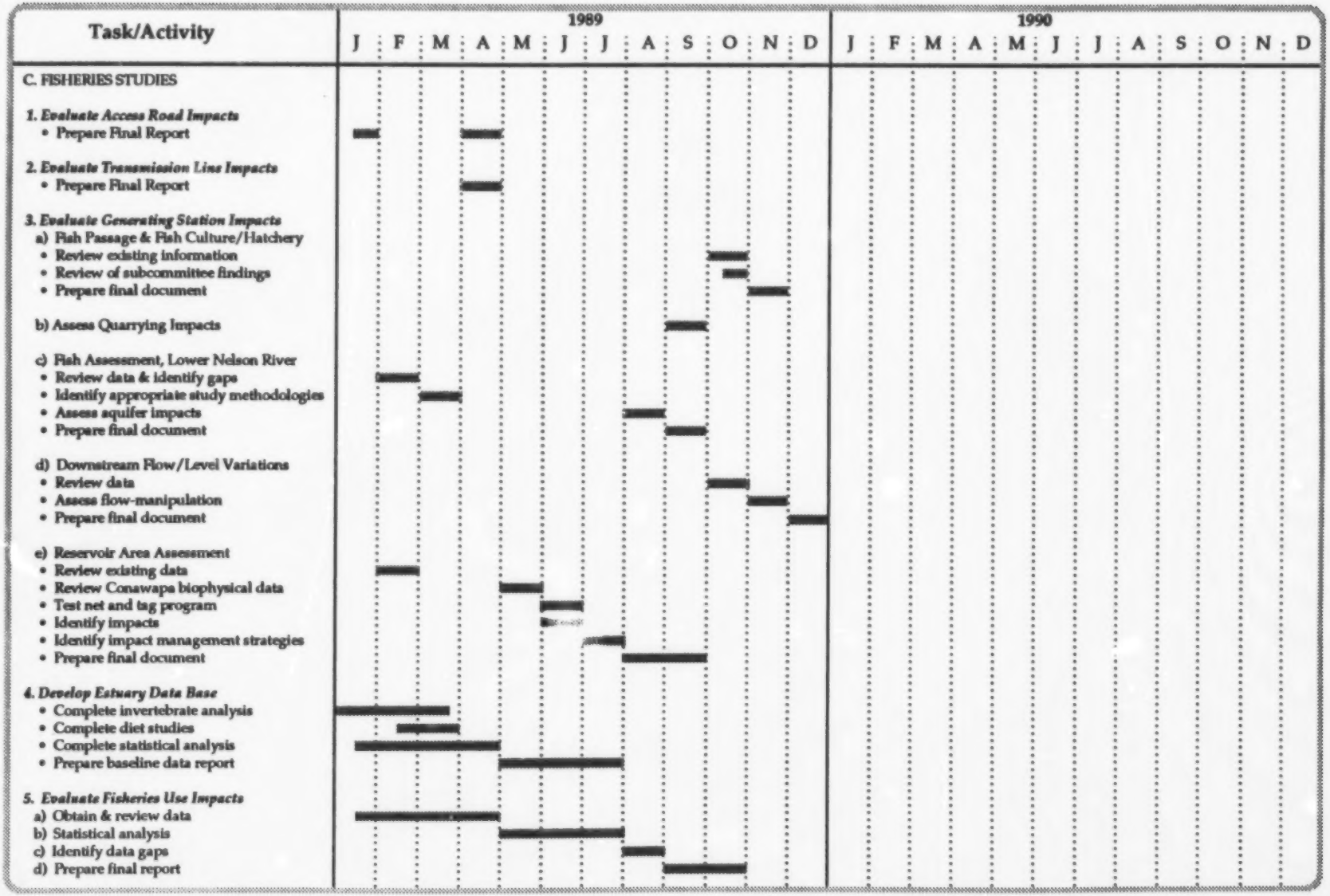
B. TERRESTRIAL AND WILDLIFE STUDIES
1. Shoreland Assessment
• Analyze relevant project characteristics
• Map/document shoreland changes
• Analyze resource data for affected sites
• Agency input/review
• Assess impacts on vegetation & wildlife
• Develop impact management program
2. Estuary Assessment
• Analyze relevant project characteristics
• Review existing information
• Agency input/review
• Prepare summary document on estuary setting
• Identify data gaps & additional studies
• Assess impacts on estuarine wildlife
• Develop impact management program
3. Facilities, Access, Transmission Line Assessment
• Analyze/update facility characteristics
• Analyze 1988 field data/existing information
• Agency input/review
• Assess impacts on vegetation & wildlife
• Develop impact management program
4. Prepare Final Assessment

CONAWAPA WORK PLAN AND SCHEDULE


Task/Activity
1989
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C. FISHERIES STUDIES
1. Evaluate Access Road Impacts
• Prepare Final Report
2. Evaluate Transmission Line Impacts
• Prepare Final Report
3. Evaluate Generating Station Impacts
a) Fish Passage & Fish Culture/Hatchery
• Review existing information
• Review of subcommittee findings
• Prepare final document
b) Assess Quarrying Impacts
c) Fish Assessment, Lower Nelson River
• Review data & identify gaps
• Identify appropriate study methodologies
• Assess aquifer impacts
• Prepare final document
d) Downstream Flow/Level Variations
• Review data
• Assess flow-manipulation
• Prepare final document
e) Reservoir Area Assessment
• Review existing data
• Review Conawapa biophysical data
• Test net and tag program
• Identify impacts
• Identify impact management strategies
• Prepare final document
4. Develop Estuary Data Base
• Complete invertebrate analysis
• Complete diet studies
• Complete statistical analysis
• Prepare baseline data report
5. Evaluate Fisheries Use Impacts
a) Obtain & review data
b) Statistical analysis
c) Identify data gaps
d) Prepare final report

CONAWAPA WORK PLAN AND SCHEDULE